

# Trace Perchlorate in Groundwaters of the Pajarito Plateau, Española Basin and the Rio Grande North of Taos, New Mexico

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# ACKNOWLEDGMENTS

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# OUTLINE OF PRESENTATION

**Why Determine Background?**

**Analytical Methods**

**Study Areas**

**Aquifers Tested**

**Testing Period and Analyses**

**Results**

**Perchlorate in Precipitation**

**Findings and Conclusions**

# WHY DETERMINE BACKGROUND?

**Assess groundwater impacts of known anthropogenic sources**

**May help in determining drinking water and cleanup standards, modeling risk/exposure, pathway analysis, tracer, etc.**

# ANALYTICAL METHODS

## Liquid Chromatography/Mass Spectrometry/Mass Spectrometry (LC/MS/MS) (EPA SW846 LCMS by 8321A)

Method can detect perchlorate to 0.05  $\mu\text{g/L}$ ;  
quantify to about 0.20  $\mu\text{g/L}$ .

Performance evaluation on the method  
conducted by LANL and NMED in 2003: results  
favored the method for low-level, sub-  $\mu\text{g/L}$   
concentrations.

# ANALYTICAL METHODS

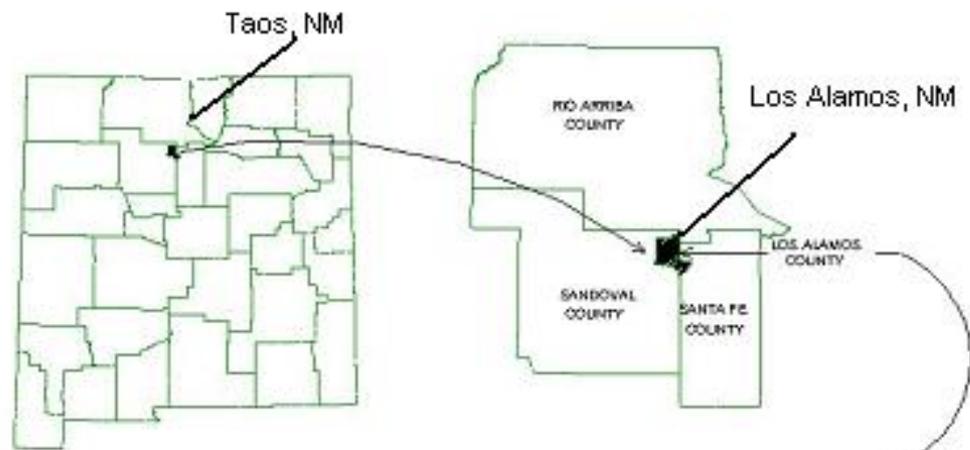
**Ion Chromatography/Mass Spectrometry/  
Mass Spectrometry (IC/MS/MS)  
(EPA SW846 8321A Perchlorate ICMSMS)**

**Method can detect perchlorate to 0.0012  $\mu\text{g/L}$ ;  
quantify to about 0.01  $\mu\text{g/L}$ .**

# **STUDY AREAS**

**Los Alamos, NM – Springs and wells located in the Sierra de Los Valles and Pajarito Plateau**

**Taos, NM - Springs located along the west and east side of the Rio Grande**



# AQUIFERS TESTED

## Los Alamos Area

Perched volcanic in mountain block/front and perched beneath the Pajarito Plateau; submodern to modern age with short flow paths. Twelve stations sampled with 20 results.

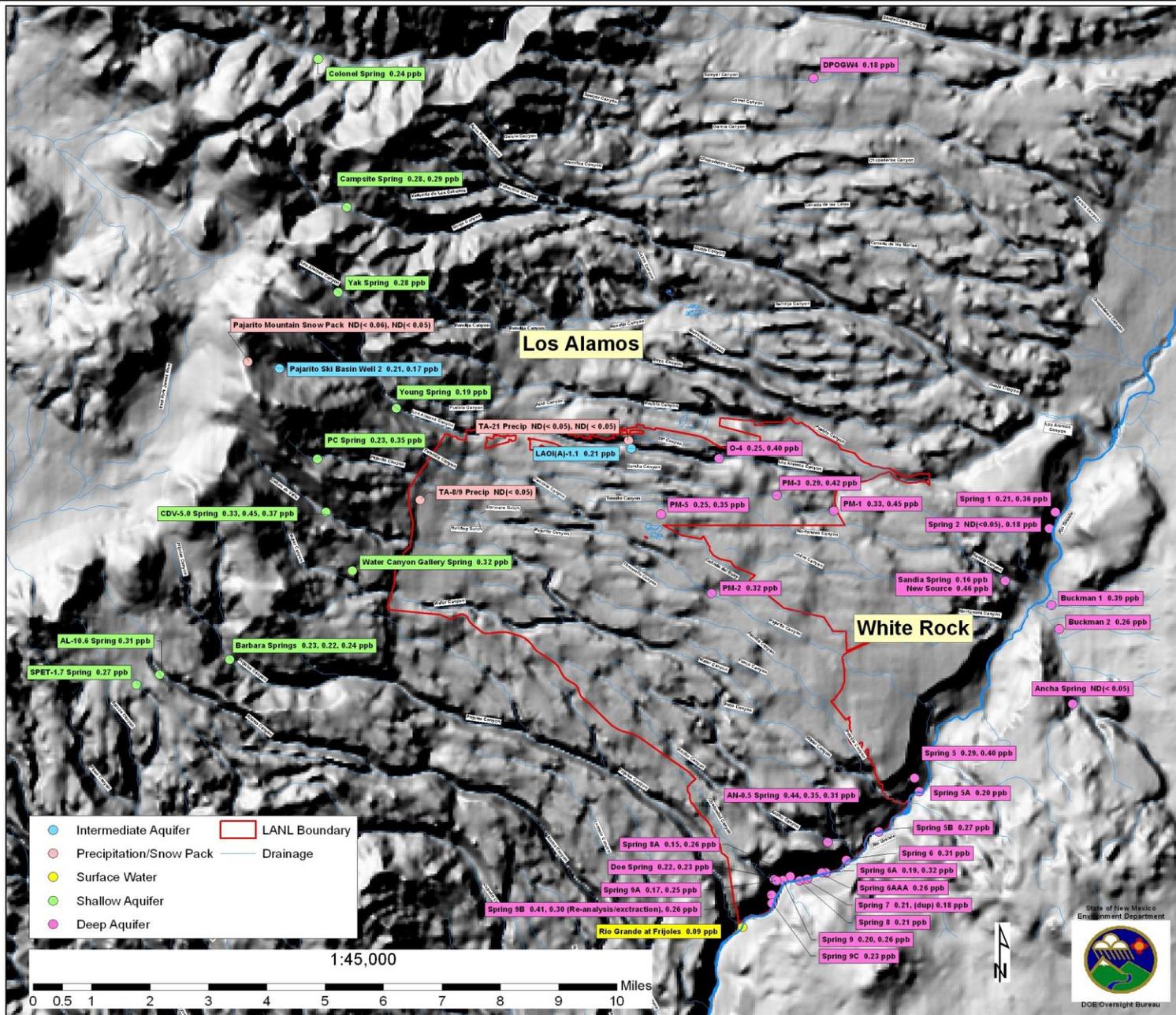
Pajarito Plateau regional system; probably >1000 yrs age with long flow paths. Twenty-two stations sampled with 36 results.

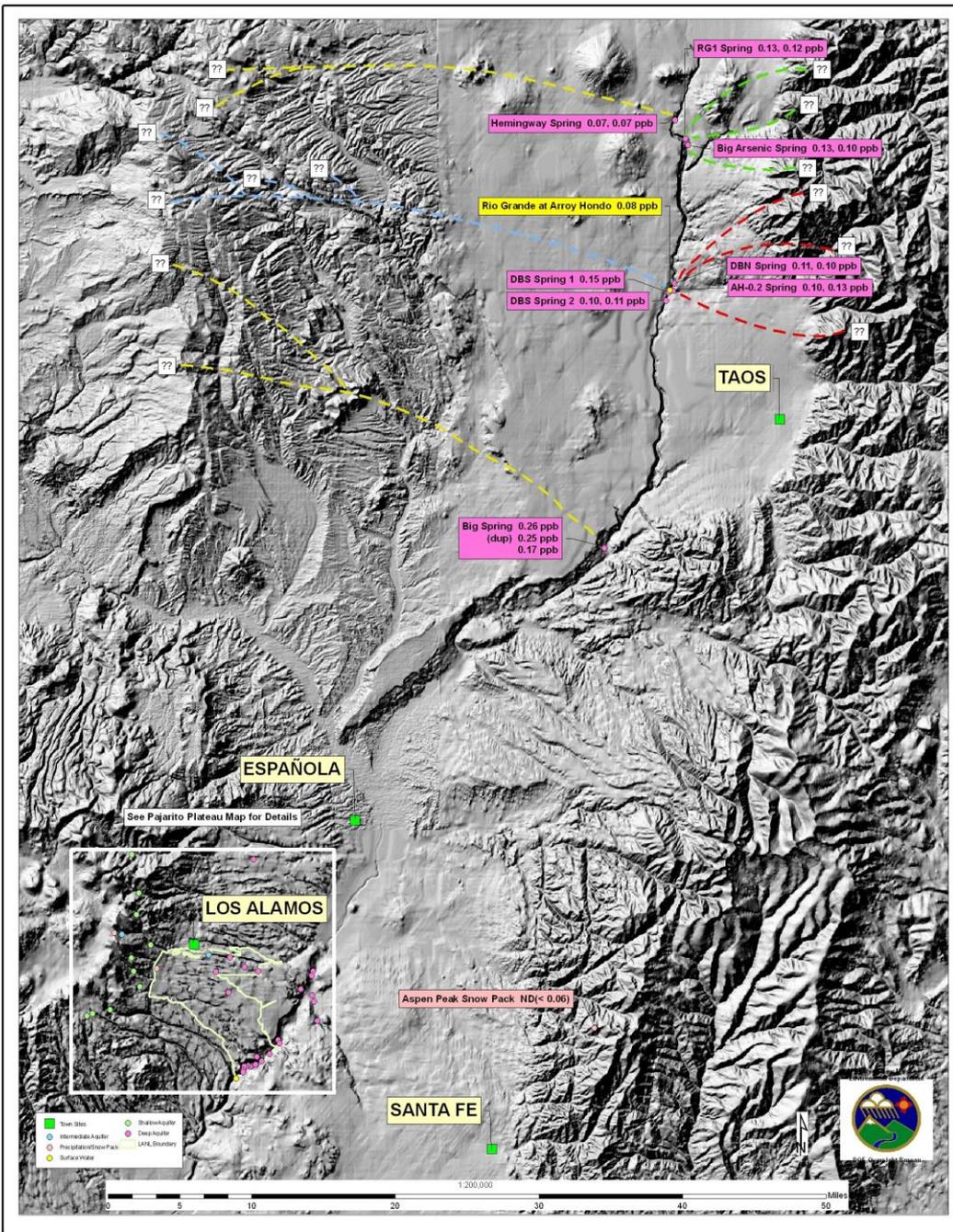
## Taos Area

West side Rio Grande north of Taos – assumed regional; probably >1000 yrs age with long flow paths. Three stations sampled with five results.

East side Rio Grande north of Taos – assumed intermediate; submodern to modern age with short flow paths. Four stations sampled with seven results.

West side Rio Grande south of Taos – assumed regional; probably >1000 yrs age with long flow path. One station sampled with two results.





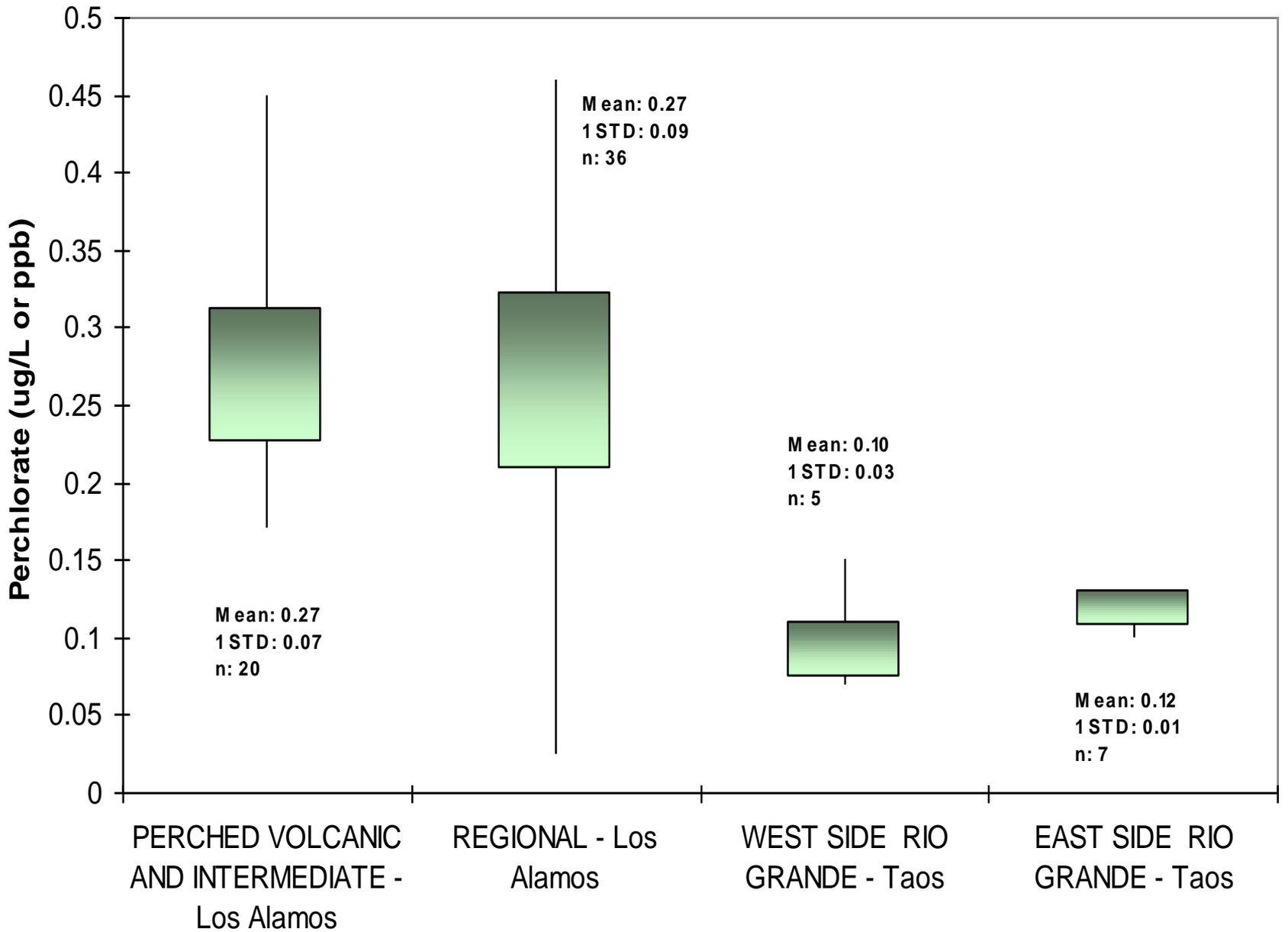
# **TWO-YEAR TESTING PERIOD**

**2003 and 2004 (total of 76 results  
from 47 wells and springs)**

## **ANALYSES**

**In addition to perchlorate, samples were  
analyzed for major ions, trace metals,  
low-level tritium, and stable isotopes.**

# RESULTS





## PERCHLORATE IN LOCAL PRECIPITATION

Four non-filtered snow-pack samples - perchlorate not detected greater than 0.05 – 0.06  $\mu\text{g}/\text{L}$ .

Three non-filtered rain samples - perchlorate not detected greater than 0.05  $\mu\text{g}/\text{L}$ .

Two non-filtered rain samples contain 0.0099 and 0.021  $\mu\text{g}/\text{L}$  using the IC/MS/MS method – detection limit at 0.0012  $\mu\text{g}/\text{L}$ ; reporting limit at 0.01  $\mu\text{g}/\text{L}$ .

**IS IT REALLY THERE?**

# FINDINGS AND CONCLUSIONS

- **Perchlorate is present in background groundwaters in the Los Alamos and Taos areas.**
- **Little variability within the Los Alamos/Pajarito Plateau groundwater system. Concentration does not vary along the flow path from recharge to discharge, suggesting that it enters, or is produced, in the system early.**
- **Taos area groundwater contains less perchlorate than the Los Alamos groundwater.**
- **Concentration inversely correlates with the oxygen isotope composition – more depleted, higher elevation, less perchlorate. This behavior may be due to the variability in evapotranspiration with respect to recharge elevation.**
- **Due to the current threshold of instrument detection limits, it is difficult to determine if perchlorate is present in precipitation.**